DOCUMENT RESUME

ED 297 874 PS 017 510

AUTHOR Stallings, Jane
TITLE Longitudinal Findings for Early Childhood Programs: Focus on Direct Instruction.
PUB DATE Jun 87
NOTE 10p.; In: The Lipman Papers: Appropriate Programs for Four-Year-Olds; see PS 017 508.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; Comparative Analysis; *Compensatory Education; *Early Childhood Education; Educational Practices; Followup Studies; Grade Repetition; Graduation; Longitudinal Studies; Montessori Method; *Outcomes of Education; Program Effectiveness; Sex Differences; Teacher Role; *Young Children
IDENTIFIERS *DARCEE Program; *Direct Instruction Model; Follow Through Services; Montessori Preschools; Project Head Start

ABSTRACT

This paper reports short- and long-term outcomes of the Direct Instruction Head Start and Follow Through program model. Based on the premise that positive reinforcement is essential to maximum academic success, the Direct Instruction program was developed from an academic preschool model which specified exactly what children needed in order to succeed academically and dictated how teachers should modify children's behavior. The Follow Through program was developed to provide programs for kindergarten through 3rd grade that would help maintain gains made in Head Start or other preschool programs. In 1983 the Follow Through program could be found in 60 American cities and a number of foreign countries. Research suggested that the Direct Instruction/Follow Through program had a positive effect on reading and mathematics achievement. However, third-graders who received direct instruction, more often than comparison children, attributed academic success to external factors and failure to themselves. They also scored lower than children receiving cognitive developmental instruction on a test of nonverbal problem-solving. Longitudinal findings suggested that students receiving direct instruction had lower grade retention and higher attendance and graduation rates. Longitudinal comparison of direct instruction, Montessori, DARCEE, and traditional preschool programs revealed positive outcomes for children who received direct instruction: Follow Through children achieved at grade level when they were in the ninth grade. (RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED297874

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Longitudinal Findings for Early Childhood Programs: Focus on Direct Instruction

Jane Stalling
University of Houston

This paper describes short-term and long-term effects of the Direct Instruction Head Start and follow through model which is based upon Skinner's Theory of Operant Conditioning. Operant Conditioning is a term of learning in which a designated behavioral act is reinforced in order to bring about its regular occurrence.

There are many points of view regarding what children should learn in school and how they should learn it. Throughout the history of American education, the pendulum has continually swung from classical education to experiential education to basic education. Events in our culture have often guided the educational trends (e.g., Sputnick led to increased focus on math and science). The Civil Rights legislation gave birth to the Head Start (HS) and Follow Through (FT) programs, whose intent was to improve the life chances of economically deprived children. These broad-based experiments allowed educational researchers to test ideas regarding the effects of teaching strategies upon child learning.

The educational programs funded through Planned Variation Head Start and Follow Through included models based upon the theoretical ideas of philosophers and psychologists such as Piaget, Dewey, Levin and Skinner. Each sponsor who developed and proposed an educational model for funding believed that their program would enhance the school success of economically deprived children. Their designs included specific classroom materials to be used, arrangements of activity centers, grouping arrangements of teachers and classroom aids, and interaction patterns of teachers and children.

Each sponsor had specific goals for the children's growth and development. Some sponsors sought a balance between the development of socio-emotional skills, physical skills and cognitive skills. These sponsors were more likely to provide programs which included the use of manipulative materials and interactions that lead to intrinsic rewards. These theorists believe children to be the initiators of action. Other sponsors focused more singularly on developing basic skills in reading and mathematics. They believe that children respond to stimuli in the environment and learn best when this is carefully regulated by the teacher. Their expectation is that children's self-esteem develops as they feel competent in school subjects. These differences in belief regarding how children grow and develop have existed throughout educational history.

The purpose of this paper is to describe short-term and long-term effects of the Direct Instruction Head Start and Follow Through model, which is based upon Skinner's theory.

PS 018510

Direct Instruction/Follow Through and Head Start

The Direct Instruction Follow Through model grew from the highly structured Bereiter-Engelmann (BE) preschool program. This academic preschool program was an anomaly when it was created by Bereiter and Engelmann (1966). The major objectives of the BE Direct Instruction program were to help children acquire basic skills in arithmetic, to develop effective use of language, and to master visual symbols and basic color concepts. Through academic achievements, the children were expected to increase their self-esteem and develop self-confidence. The program was developed especially for children from lower income homes who lacked language skills necessary for success in school. In Beller's words, "The academic preschool was designed as a crash program of language remediation to help four- and five-year-old lower income children catch up to middle-class children" (1973).

Most other preschool programs in the 1960's and 1970's were developed to foster the cognitive, social, and emotional skills of children. In essence, they were responsive to the needs of the whole child. In sharp contrast, the academic preschool model specified exactly what children needed to succeed academically in school and dictated how teachers should modify children's behavior. This model stood out in the crowd of

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Rosestelle B. Woolner
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

preschool models: cheered by behavioral psychologists, jeered by cognitive developmentalists. The latter group felt it unwise or even criminal to subject young children to narrowly focused academic activities.

Behavior modification models grew out of the learning theories of Pavlov (1927) and Skinner (1968). These theorists submit that any healthy animal or person can be taught to perform tasks successfully if the unit of learning is small enough and if the reinforcement offered is desired by the subject. The Academic Preschool Program's curriculum and practice were based upon Skinner's operant conditioning theory. Operant conditioning is a form of learning in which a designated behavioral act is reinforced in order to bring about its regular occurrence. In operant conditioning, the response or behavior operates upon the environment to generate consequences. The consequences are contingent upon the emission of a response. If the response is acceptable, the consequence is pleasant and the response is reinforced. A simple example is a mother asking a child to put napkins on the table (stimulus); the child does (response); the mother says, "Thank you. You are a big girl to help mother," thus reinforcing the child's helping behavior.

In comparing the cognitive developmentalists and the behavior modifiers, Maccoby and Zellner (1970) had the following to say:

> The cognitive developmentalist, following the Piagetian theory, believes that the process of education is one of building cognitive structures in the mind of the child. The behavior modifier is not to say that he does not know what cognitive structures are -- that he believes these are fiction, myths, invented by psychologists, that serve more to hinder than to help his understanding of how the child learns. The behavior modifier conceives of education as a process of producing changes in observable behavior. Usually the changes take the form of adding new responses to the child's repertoire -- like filling up an empty jar with marbles, adding one marble at a time....Reinforcement is the mechanism that produces this result. The behaviorist does not, of course, believe that nothing goes on inside the head -- only that it is not profitable to speculate about these internal processes, since they cannot be directly observed or controlled. The only thing we can control is what we observe, and all we can observe is behavior. (p. 34)

Early reports for the Academic Preschool Program of Bereiter and Engelmann indicated that after two years in the academic preschool, children made greater gains on the Stanford-Binet and the Wide Range Achievement Test than children of comparison groups who had not received such intensive academic training. Upon entering the first grade, the experimental children achieved at nearly the second-grade level in reading, arithmetic, and spelling. As with other preschool programs, the success of the children was short-lived. At the end of the first-grade year, there was little academic difference between treatment and control children (Beller, 1973, p. 570).

Encouraged by their initial success with preschool children, Bereiter and Engelmann responded to the government's request for proposals to provide educational programs for kindergarten through third grade that would aid children to maintain the gains achieved in Head Start or other preschool programs. The Academic Preschool Program developed for the elementary school is now known as the Oregon Direct Instruction program. This program was awarded Follow Through Planned Variation funds and was subsequently implemented in twenty locations across the nation. In 1983, this Follow Through program could be found in sixty American cities and a number of foreign countries.

The Direct Instruction program is based upon the premise that positive reinforcement is essential to modifying student behavior and maximizing children's academic success. To implement the belief that children can be trained to succeed, a carefully sequenced curriculum and a rigidly controlled instructional process are required.

For all grade levels of children in their model, Carl Bereiter and Seigfried Engelmann created sets of curriculum for reading, spelling, language arts, and mathematics. The lessons were presented in small hierarchical steps. Teachers presented a bit of information; children repeated the information; teachers asked a simple direct question about the information; children responded. If the response was correct, the children

were praised. If the response was wrong, the teacher corrected children and the process was repeated until the children repeated the right answer automatically. Then and only then did they proceed to the next sequence. The drill and practice was kept at a rapid pace with systematic and enthusiastic praise for right answers.

The Follow Through program required curricular materials for kindergarten through third grade. Thus, materials were prepared for reading, spelling, language arts, mathematics, science, and music for each of these grade levels. Since Planned Variation Follow Through was a national model, the instructional process for using the curriculum had to be made essentially teacher proof. To accomplish this, a script was prepared for each lesson to be used by teachers and classroom aides in all parts of the country.

The Follow Through approach that evolved under the direction of Seigfried Engelmann and Wesley Becker required three adults trained in Direct Instruction methods in each classroom. For reading, math, and language development, children were grouped on the basis of their ability according to criterion tests given weekly. The classroom teacher was usually responsible for the reading program; a full-time aide was responsible for the math program; and a second full-time aide was responsible for spelling and handwriting. In order for the children to receive maximum amounts of stimulation and praise during a learning session, the teachers worked with eight to ten children at a time and addressed most questions and praise to the group. By addressing the group, the teacher was attempting to keep all participants totally engaged all of the time. The teacher might rapidly question individuals to see if they had learned each step, but primarily the teacher addressed the entire group.

Individual learning problems were diagnosed through weekly testing and each child then received the drill and practice necessary to learn required skills. In this model, the teachers were the directors. They initiated each stimulus and quickly reinforced or modified each response. They controlled the students, keeping them on task through continuing interactions and positive reinforcement. Students and teachers shared the pleasure and the excitement of correct responses. Observations conducted by Stallings and Kaskowitz (1974) found 90 percent of the Direct Instruction teachers in five urban and rural locations implementing the model as specified by the developers. These findings indicated that the educational model and the teacher training program were transportable to urban and rural sites.

Since its inception, the Direction Instruction Follow Through program has been reported to have a positive effect upon children's reading and mathematics achievement test scores (Abt Associates, 1977; Stebbins, St. Pierre, Proper, Anderson, & Cerva, 1977). Of the nine major Follow Through models evaluated, Direct Instruction ranked highest in reading and mathematics. In 1977, Becker reported the average scores for the students in the program corresponded to the 49th-50th percentile on the Math, Language, and Spelling subtests of the Metropolitan Achievement Test, and the 41st percentile in reading. Stallings, (1975) also found that first- and third-grade children in the Direct Instruction (DI) Model Scored higher in reading and math than children in the seven other Follow Through models in that study.

Other interesting findings, from a test which indicates who children feel are responsible for their achievement, revealed that third grade (DI) children more often than comparison children attributed their academic success to their teachers or other factors outside of themselves, and attributed their failures to themselves (Stallings, 1975). Another surprising finding was that the Direct Instruction third-grade children scored lower than children in cognitive developmental models on a test of non-verbal, problem-solving abilities (Ravens Progressive Matrices). The (DI) children who spent most of their time at school in rapid paced drill and practice activities or completing carefully sequenced worksheets had little opportunity to learn about relationships among items since they seldom used concrete manipulative materials. This lack of experience in taking things apart, putting them back together, learning relationships, and seeing how things fit together may have contributed to their low scores on the problem-solving test.

The primary question posed to all educational models is: What are the long-term effects? Will children who have learned through carefully sequenced lessons and teacher guidance during the initial stages be able to work and learn independently in classrooms that do not provide the support and consistency of the Follow Through program?

Several studies have examined the longitudinal effects of the Direct Instruction model. In these studies the researchers have tracked the original control and experimental children. Becker and Gersten (1982) found that fifth- and sixth-graders in five sites had scored higher than control children on the Wide Range

Achievement Test in reading decoding, math, and spelling. The authors note that the magnitude of the effects was appreciably lower than it had been in third grade. A quasi-experimental follow-up study by Meyer, Gersten, and Gutkin (1983) found that New York fifth graders who had experienced four years of Direct Instruction in kindergarten through third grade scored significantly higher than comparison students and were at ninth-grade level in reading and 8.6 grade level in math. Although the findings are not consistent across sites, there is evidence to indicate that Direct Instruction ninth-grade students are more likely to attend school and less likely to be retained than comparison students. It also appears that the students who experienced Direct Instruction were more likely to graduate. Of the twenty-three New York students who started the program in 1969, 57 percent graduated, compared to 35 percent of the twenty-nine comparison students; 4 percent had been retained, compared to 7 percent of the controls; 39 percent had applied to college, compared to 10 percent of the controls.

Clearly, the longitudinal findings regarding retention, attendance, and graduation have important implications for the cost effectiveness of the Direct Instruction model. While academic achievement is in itself important, it is likely that the DI students' success in school contributed significantly to their greater commitment toward schooling. This behavioral philosophy is based upon the idea that success reinforces success. Their goal is to have students succeed academically. They believe that if children's lessons allow them to succeed at a 90 percent rate, children will eventually expect to succeed, and they will!

Longitudinal Study Comparing Direct Instruction, Montessori and DARCEE

Another longitudinal study of early intervention programs that included findings regarding the Direct Instruction model was conducted by Miller and Bizzell (1984). They followed the progress of children who in 1968-1969 attended four different Head Start programs in Louisville, Kentucky. Ninth- and tenth-grade results are reported for children who participated for one year in Bereiter-Engelmann's Direct Instruction (BE), Susan Gray's DARCEE, Montessori, and traditional pre-kindergarten. A control group of children not attending Head Start was also recruited and included in the follow-up studies.

The experimental children, predominantly low-income and 90% black, were randomly assigned to the programs. Controls were recruited from neighborhoods in which the experimental classes were located. Fourteen classes were developed: four each for BE, DARCEE, and traditional; two for Montessori. At the end of the pre-kindergarten year, 214 experimental children were in the sample.

The Preschool Inventory (PSI) (Caldwell, 1968) was administered eight weeks after the children started preschool and at the end of the preschool year and at the end of kindergarten. California Achievement Test scores were obtained from the school systems at the end of 1st and 2nd grades. Stanford Achievement Test scores were available for children in 4th through 8th grades, and scores from the Comprehensive Test of Basic Skills were available for children in 9th and 10th grades. The STEP-Locator, a brief test of language and math skills, was administered to the 9th and 10th graders by the research staff. Intelligence was measured with the Stanford-Binet (Terman & Merrill, 1960) at the beginning of the preschool experience and at the end of preschool, 1st, 2nd, and 8th grades. Beginning in spring, 1977, the Wechsler Intelligence Scale and the Stanford-Binet Intelligence Test were administered in alternate years by the research staff.

The results indicate that the academic and IQ trends established by the end of kindergarten persisted into the 9th and 10th- grade years. These figures show that only the Montessori boys were not lower in IQ at 10th grade then at the end of the pre-kindergarten. At the end of 10th grade, the Montessori boys were operating above national norms academically and were within the normal range of IQ. This was 15.3 points above the 10th-grade DARCEE boys who had started at the same IQ level as Montessori boys in preschool.

IQ scores for the Montessori girls increased at the end of preschool and then dropped off radically. The control girls and the DARCEE girls started the study eight to ten points higher academically than other girls and for the most part maintained this academic superiority throughout the study. Only at the 6th grade did the academic scores of BE, DARCEE and Montessori converge.

It is possible that these puzzling findings are due to chance. However, considering the original random assignment and considering that attrition has not been differential, the change factor is not a plausible

explanation. In fact, Miller and Bizzell (1984) report that, in the Montessori schools, attrition was in a direction that lowered the probability of positive outcomes (p. 23).

The Montessori Program

If the Montessori preschool program had a very positive effect upon young boys, what made the program effective for boys? To consider this question, let us examine the Montessori program.

Maria Montessori believed that the motivation to learn is present at the start of life and that appropriate activities or materials activate the motivation to learn. The fundamental task of education is setting the child free to learn from the environment. The educators' responsibility is to design and organize the environment so that children can learn through self-correcting materials and activities. With self-correcting materials, children learn from direct experience. Teachers' judgment of success is not needed. The materials provide the feedback to the children and set them free to do their own correcting and to set their own pace.

Montessori believed that sensory experiences were directly related to the development of the child's mind. Beller (1973) summarized this theory as follows:

> Intelligence is the ability to classify. Classification consists of analyzing an object and extracting a determined attribute therefrom. If this capacity for selecting single attributes is not acquired, associations by means of similarities, synthesis and all higher work of intelligence becomes impossible. (p. 562)

The highly structured curriculum Montessori developed was based upon the assumptions about knowledge acquisition described above.

The Montessori program is dependent upon specific materials developed over the past 70 years. These same materials are present in each Montessori classroom regardless of the geographical location or social status of the clientele. All preschools will have the same materials (e.g., the brown stairs and pink tower) which can only be assembled in one way. The child's task is to assemble the pieces in the single correct way.

During the Montessori training, teacher candidates learn to organize and present these materials in a specified sequence. They also learn how to present or demonstrate the materials to individuals or small groups of children. Children are expected to attend to instruction, to finish each task, and to put away their own materials.

Teachers in this model are encouraged to be supportive and facilitative: they should not develop emotional dependence in children. Their function is to be a director and monitor and to intervene as little as possible with the children. Task orientation is the focus of the relationship between children and teachers. Montessori thought that strong emotional ties were likely to interfere with task performance. Children are encouraged to control their emotionality and to become self-sufficient. With teachers modeling this behavior, mutual respect and helpfulness were expected to develop between teachers and students.

External rewards and punishments are discouraged. Montessori believed that children have an inner force that provides a stronger motivation than any extrinsic incentive. Each lesson or activity has a specific objective: the child's pleasure is derived from completing the task and meeting the objective. When children complete tasks, they inform the teacher, replace the materials, and receive a new lesson determined by the teacher. With minimal verbalization, the teacher states the objective of the new lesson. The children are not hurried through tasks or criticized for mistakes. The cornerstones of this model are to activate children's motivation to learn and to help them develop the self-discipline to complete tasks.

Although children are at liberty to complete each activity at their own pace, the sequence of the activities is strictly controlled by the teacher. The sequencing enables the child to first discriminate between items and to match sensory qualities such as size, color, or pitch. Next, qualities are ordered according to dimensions as tall to short, thick or thin. Eventually, the child is able to differentiate and integrate sensory

dimensions. In this approach to child learning, the teacher provides minimal verbal labeling and description. The child learns through direct sensory experience.

The curriculum is meant to provide exercises for all of the senses. Thus, it includes reading, writing, numeration, weights and measures, pottery, painting, music, cooking, role playing, construction blocks, gardening, and other practical life experiences appropriate for each age group (Stodolsky, 1972).

Given these curriculum materials and experiences, and the instructional processes employed by Montessori teachers, it seems clear that this program is oriented toward the development of sorting, matching, classification skills, fine motor coordination, self-assurance, task persistence, and independence, and not so much toward verbal or social development.

It is of considerable interest that a specific program would be more beneficial to boys than to girls. Overall, the girls in the study had higher achievement levels than the boys except in the Montessori program. The most plausible explanation may be found in some component of the Montessori program which is particularly beneficial for disadvantaged four-year-old boys. Something within the structure sequencing of the self-correcting Montessori materials may have allowed the boys to develop discrimination, classification, and focusing skills. Such skills are required for taking tests and performing well in school. Perhaps the spatial qualities of the materials were more helpful to the boys than to the girls. Boys are typically less mature than girls at age four, and it may be they were more susceptible to the effects of this individually paced, structured program than were the girls. That is, their cognitive structures were more pliable and were more influenced by their experiences than were the girls. Perhaps there are teachable moments when children are more likely to learn through the sensory experiences that Montessori believed were so closely related to the development of the child's mind.

The DARCEE Program

In the DARCEE program, the girls tested approximately at grade level in the 9th and the 10th grades, but the boys were achieving at the 6th-grade level. Was there something in the DARCEE program that was better for girls than for boys?

The program, developed by Susan Gray at Peabody College, was based upon the premise that to succeed in school children need to develop basic concepts such as color, shape, size, and sequence. In addition, the program focused upon language development since the low-income children the program served had limited school vocabularies. School achievement was also thought to depend upon children's motivation achieved in school.

The 31 children in the program attended a daycare center five days a week during the school year. The instruction provided to the 31 children in DARCEE was observed to have a greater amount of verbal instruction than other programs. Visual and manipulative materials were used, but usually in a group format. Part of the purpose of these activities was to help children learn to take turns using materials rather than learning at an individual, exploratory pace. The time spent observing other children use the materials was likely to be as great as the time each child spent using the materials (Miller & Bizzell, 1983a, p. 26). This is quite a contrast from the Montessori program, which provided for more individual manipulation of materials and less verbal interaction than other programs.

Since girls are known to mature faster than boys during the preschool years, Miller and Bizzell hypothesized that "between the ages of four and five when this sample entered pre-kindergarten the little girls were more ready to process information gained through observation and verbal instruction, particularly in the group setting, while the little boys needed more kinesthetic methods of instruction and/or more hands-on manipulation of materials in the learning of specific concepts" (p. 25).

This is a rational hypothesis, but it does not explain why the DARCEE and control girls had such similar test scores. The control girls, who did not participate in a preschool program, started with slightly higher achievement test scores, but DARCEE girls started with slightly higher IQ scores. At the 8th, 9th and 10th grade, the control and DARCEE girls were similar to each other and considerably higher than girls from the other three programs. Unless there is something special in the control children's home and grade

school experiences, this finding indicates that for girls, the preschool experience had little positive academic effect in subsequent years.

The Bereiter-Engelmann (BE) Direct Instruction Program

The 37 children in the BE sample started preschool at approximately the same IQ level as children in the other programs, but the girls' IQ scores dropped 10 points by the end of 10th grade. Montessori girls' IQ scores dropped a similar amount. The BE boys' scores also dropped, but not so much as the girls.

The BE boys' achievement test scores hovered slightly above the 50th percentile, and the BE girls' achievement test scores were slightly below that point, but at preschool and at 10th grade. The boys' scores dropped dramatically at lst grade but rose to slightly above the 50th percentile by 10th grade. At 10th grade, the BE boys tested higher than did DARCEE, traditional, and control boys, but the DARCEE and control girls scored higher than the BE girls.

Actually, these BE children held their own in school, but progressed very little beyond their entry point. It may be that this didactic preschool program, which required one teacher and at least two classroom aides constantly focusing the children's attention on fast-paced drill and practice activities, was not productive in the long run. When the children entered school and did not receive this type of tight structured program, girls in particular did not function well in the traditional classrooms.

The four Head Start programs summarized by Miller and Bizzell (1983) indicate strong and continuing program effects for Montessori boys. A possible explanation for their high scores on achievement tests may be an interaction between the individually paced, self-correcting, cognitive materials of the Montessori program and four-year-old boys' cognitive receptivity. The Montessori program and materials require focused attention and completion of activities -- skills that would serve children well in later school experiences.

Other children in the study fared less well when compared with the Montessori boys or control children who did not attend preschool. Control girls' IQ test scores dropped less than did girls' scores in the four preschool programs. Further, control girls' achievement test scores were as high as or higher than all other girls at 8th, 9th, and 10th grades.

Control boys achieved at the same rate as did boys who attended traditional preschools and scored higher than the DARCEE boys from 2nd grade through 10th grade. The control boys' IQ scores were more consistent than other boys' scores throughout the study, increasing the most at the end of kindergarten. This pattern of IQ scores increasing at kindergarten was also true for control girls. Interestingly, IQ scores peaked for the children in the four preschool programs at the end of the preschool year and tended to drop at the end of kindergarten.

This pattern suggests that experiences the children had in preschool (for program children) or in kindergarten (for control children) prepared them to score higher on the Stanford-Binet IQ test than they did prior to those experiences. This finding suggests that school experiences are closely related to the abilities examined by the Standard-Binet. Except for the Montessori boys, the pattern for IQ scores was to drop off at the end of the children's second year in school; kindergarten for program sample and first grade for control. This finding does not suggest that students became less intelligent. They most likely scored just as well on the same IQ test items; however, their increasing age would require them to complete more items correctly to maintain IQ scores set in the previous year; for example, a score of 90 at age five requires more items correct than a score of 90 at age four. A possible explanation for the drop in IQ scores may be that school experiences and IQ test items did not continue to have the same positive relationship as they did initially. It is possible that IQ scores serve as a test of experience rather than intelligence. Only the Montessori boys' school experience seems to have provided them with skills or the abilities required to continue to grow cognitively; that is, complete more IQ items each year relevant to their age.

The analyses of the DARCEE, Montessori, BE/Direct Instruction, traditional, and control groups were unique in separating effect for girls and boys in the programs. The control children did not attend preschool and provided interesting findings, though potentially disturbing to preschool advocates. The control girls achieved as well or better than other girls in the study when tested in the 7th, 8th, and 9th grades. The control boys tested higher than did boys in two of the preschool programs. The researchers suggest this

higher achievement by control children was due to the fact that they were from slightly higher socio-economic homes, since these families had not applied for entrance into the Head Start programs. However, control children's IQ scores were lower than other children at the first testing, while their achievement test scores at the same time were higher than other children's. Unless there was something especially nurturing in the homes of these children and absent from the other homes in the study, the case for sending children to preschool in order to achieve academically in school is not strong.

Another puzzling and interesting finding from the study was that after the 1st grade, the boys who had experienced the Montessori preschool program scored significantly higher than all other children at each of the following six-year testing points. The Montessori girls did not succeed in school in the same way. Only the girls in the traditional preschool had lower test scores than did the Montessori girls. Further, the Montessori boys' IQ scores did not drop lower by the end of the 10th grade, as did the IQ score for children in all other groups. We can only speculate that an interaction exists between four-year-old boys' cognitive structure and self-paced, self-correcting materials such as those used in the Montessori preschool program. This does not suggest that only four-year-old boys in the Montessori program will benefit from these materials. Perhaps three-year-old girls, who mature cognitively at an earlier age, or children in their own homes, would also benefit from these materials.

Summary

The findings from the Miller & Bizzell study report the effects of a one-year preschool intervention. This study, as well as other follow-up studies on a one-year preschool program, reports no longitudinal effects of the DI model. However, research studies using longitudinal achievement data from 1st - 3rd grades and 6th - 9th grades reveal positive outcomes for DI children. Apparently, children do need more than one year of this highly structured verbal program to succeed later in school. The children in the one-year BE Direct Instruction group reported by Miller and Bizzell (1983) achieved at about the same rate at the 9th and 10th grades as they did upon entering preschool. On the Comprehensive Test of Basic Skills administered at 9th grade, students scored at the 8th- grade level. However, the Follow Through children who participated in the Direct Instruction program from kindergarten through 3rd grade gained academically in school so that by 9th grade they were achieving at grade level. School records revealed that these children were less likely to be retained in grades, more likely to graduate, and more likely to apply for college than were the control students. Overall, the longitudinal findings for the Direct Instruction model are very positive.

References

Abt Associates, Inc. (1977). Education as experimental: A planned variation model. Reports to the U.S. Office of Education, Office of Planning, Budgeting, and Evaluation (Contract No. 300-75-0134). Cambridge, MA.: Abt Associates.

Becker, W. C. & Engelmann, S.E. (1978). Analysis of achievement data on six cohorts of low-income children from 20 school districts in the University of Oregon Direct Instruction Follow Through model. Technical Report 78-1. Eugene, OR: University of Oregon Follow Through Project.

Becker, W. C., & Gersten, R. (1982). A follow up of follow through: The later effects of the Direct Instruction model on children in fifth and sixth grades. American Educational Research Journal, 19, 75-92.

Beller, E. Kuno. (1973). Research on organized programs of early education. In R. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally & Company.

Bereiter, C., & Engelmann, S. (1966). Teaching disadvantaged children in the preschool. Englewood Cliffs, NJ: Prentice-Hall.

Caldwell, BM. (1968). Preschool inventory experimental edition--1968 administration manual.. Princeton, NJ: Educational Testing Service.

Lazar, I., Darlington, R., Murray, H., Royce, J., & Snipper, A. (1982). The lasting effects of early education: a report from the Consortium for Longitudinal Studies. Monographs of the Society of Research in Child Development, 47 (2-3), Serial No. 195.

Maccoby, E. E., and Zellner, M. (1970). Experiments in primary education: Aspects of project Follow Through. New York: Harcourt Brace Jovanovich.

Meyer, Linda. (In Press). Long-term academic effects of direct instruction follow through. Elementary School Journal.

Meyer, L., Gersten, R., & Gutkin, J. (In Press). Direct Instruction: A project Follow Through success story. Elementary School Journal.

Miller, L. & Bizzell, R. (1983). Long-term effects of four preschool programs: sixth, seventh, and eighth grades. Child Development, 54, 727-741.

Miller, L. & Bizzell, R. (1983). Long-term effects of four preschool programs: ninth and tenth grade results. Louisville, KY: University of Louisville.

Pavlov, I. P. (1927). Conditioned reflexes, trans, G. V. Anrep. London: Oxford University Press.

Skinner, B. F. (1968). Technology of teaching. New York: Appleton-Century-Crofts.

Stallings, J. (1975). Implementations and child effects of teaching practices in follow through classrooms. Monographs of the Society of Research in Child Development, 40, 17-8.

Stallings, J. & Kaskowitz, D. (1974). Follow through classroom observation evaluation. SRI International, Menlo Park, CA.

Stebbins, L., St. Pierre, R. G., Proper, E. C., Anderson, R. B., & Cerva, R. R. (1977). Education as experimentation: A planned variation model (Vol. IVA-D). Cambridge, Mass.

Stodolsky, S. S. (1972). Defining treatment and outcomes in early childhood education. In H. J. Walberg & A. T. Kopan (Eds.), Rethinking urban education. San Francisco, CA: Jossey-Bass, Inc.

Terman, L. W., & Merrill, M.A. (1960). Stanford-Binet Intelligence Scale. Cambridge, MA: Houghton Mifflin Company.